

NSLS Users' Meeting, May 21-24, 2001

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The National Synchrotron Light Source Annual Users' Meeting was held at Brookhaven National Laboratory on May 21-24, 2001. This was a record-breaking meeting in several respects: there was an all-time high overall attendance (370 registered attendees), there were seven workshops and one forum extending over three days, attended by a total of 480 people, and the cafeteria at Berkner Hall was transformed into the island of Maui for the Hawaiian luau banquet! The meeting emphasized everything that the NSLS is about: excellent science, participation and cooperation. The poor weather did not stop anyone from enjoying and participating in a most stimulating meeting.

The main meeting and banquet were held on Tuesday, May 22nd, with 3 workshops and one forum on Monday, May 21st, and 3 workshops on Wednesday 23rd, and one workshop, and a hands-on IR session on Thursday 24th. A reception was held on Monday evening, together with a poster session, music, and the opening of an exhibition by 20 vendors, which continued through Tuesday.

The week's events began early in the morning on Monday May 21 with a forum on the needs for advanced detectors for synchrotron science, organized by Peter Siddons (NSLS, BNL). This was followed by three workshops held in parallel: "Environmental Molecular Sciences," organized by Richard Reeder (SUNY, Stony Brook) & Tony Lanzirotti (U. Chicago), "Synchrotron Techniques for Catalytic Studies," organized by Jingguang Chen (U. Delaware), and "Frontiers in Structural Biology at High Brightness X-ray Sources," organized by Mike Becker (Biology, BNL) & Lonny Berman (NSLS, BNL). The workshops on Wednesday were: "Advanced Methods and Tricks of EXAFS Data Modeling," organized by Anatoly Frenkel (U. Illinois, Urbana-Champaign), "IR Micro-Spectroscopy: A Molecular Probe with Micron Resolution", organized by Lisa Miller (NSLS, BNL) & Larry Carr (NSLS, BNL), and "Applications of Synchrotron Radiation in Nanoscience & Technology," organized by Peter Johnson (Physics, BNL) and Chi-Chang Kao (NSLS, BNL). The Thursday workshops were "XAFS Data Reduction and Analysis using WinXAS" by Thorsten Ressler (Fritz-Haber-Institut), and the hands-on portion of the IR workshop. The workshops are described in separate accompanying reports.

At the Monday evening poster session there were a total of 60 posters presented. The poster judges had a difficult time deciding on the winners of the students and postdocs poster competition. After some delibera-

tion the following were awarded \$75 prizes: Kaveh Adib (Columbia University), "Chemistry of carbon tetrachloride on natural single-crystal hematite surfaces;" Cecilia Sanchez-Hanke (Brookhaven National Laboratory), "Exchange bias studies with soft x-ray circular polarized light;" Raymond Huang (Albert Einstein College of Medicine), "Characterization of bone mineral composition in the proximal tibia of cynomolgus monkeys: the effect of ovariectomy and nandrolone treatment;" and Zikri Yusof (University of Connecticut), "Quasiparticle liquid of highly overdoped Bi2212." They, and all the poster presenters, are all congratulated on their excellent work.

On Tuesday, the main meeting began with an update on the activities at BNL by Dr. John H. Marburger III, BNL Lab Director. He commented that the Light Source is by far the most productive facility in the laboratory, and with the recent closing of the medical reactor, the lab is now an accelerator laboratory with a future based on accelerator science. He reported that there is good support for the lab as a whole with local members of Congress and Senate. He is guardedly optimistic about the future of the lab, particularly the NSLS.

Dr. Richard Osgood, Jr., Associate Laboratory Director for Basic Energy Sciences, followed Marburger's welcome with a presentation on the lab's Nanoscience Initiative, emphasizing how a proposed Nanocenter at BNL could foster new collaborations with university and industrial partners, as well as spearhead interdisciplinary work among scientists at BNL. He described the proposed center as a building attached to the NSLS that would serve as "a bridge that connects the technology in the Instrumentation Division with the NSLS and with the research on materials science on site." The building would house laboratory clusters focused on topics such as materials synthesis, proximal probe microscopy, and ultrafast optical science.

Recurring themes throughout the meeting were the excitement about nanoscience, increasing the number of users, and concerns about the funding for Basic Energy Sciences, and of Office of Science overall.

Dr. Pat Dehmer, DOE's Associate Director of Science for Basic Energy Sciences gave a fascinating presentation illustrating the connection between public attitudes and funding for scientific endeavors. She emphasized that while public confidence in scientific leadership has remained fairly stable through the years, it is not based on fundamental knowledge of science,

which makes that support tenuous. "This puts a burden on us to educate the public and Congress," she said if the budget picture is to improve. She commented that the NSLS is going to have to operate with a very tight belt in the next year. However, she was optimistic about the potential for scientific advances. "We are on the verge of really explosive discoveries in chemistry and materials science," she said.

Dr. Steven Dierker, the recently appointed new Chair of the NSLS, was introduced to the user community, and shared his initial views of the facility. He gave an upbeat presentation, emphasizing that while there are challenges ahead, "Our aim must be to continue to develop the Light Source in order to maintain its excellence and usefulness to scientists." He predicted that the number of users will continue to grow, and that one avenue for this growth may be in collaborative research, for example in catalysis, materials science, soft matter physics, or studies of magnetic materials. "Many of these fields would benefit by combining suites of beam lines to provide access to many techniques and mechanisms for rapid access and quick turnaround," he said. Such a setup could also serve a larger number of users and provide for more cost-effective maintenance of facilities.

Dr. Jane "Xan" Alexander, Acting Director of the Defense Advanced Research Projects Agency (DARPA), was the meeting's keynote speaker. She commented that while the other speakers had mentioned the bleak-funding outlook in this year's budget, her agency's funding picture was looking good! Her presentation was a look into the future – a world beyond silicon-based electronic devices. Today's technology has a natural limit in the number of devices, and thus the speed that can be fabricated using silicon. She gave several examples of ways to go through, around, or under this wall. Xan talked of "molecular electronics" where it might be possible to develop computer chips on a scale that is 10,000 times smaller than today's. One idea would be to have these circuits assemble themselves from the molecular level, a fascinating thought! Another approach would be to develop electronics based on spin rather than charge ("spintronics"), which she said, could yield much faster devices and unbreakable codes.

Dr. Thomas Weber, Director of Division of Materials Research at the NSF, presented an overview of the national nanoscience initiative, with an emphasis on NSF's role. He stressed that the real driver behind the initiative is economic, not just scientific.

The day was rounded out by excellent technical presentations. Mark Chance (Albert Einstein College of Medicine) discussed the development of small gap undulator technology, and how better magnetic devices have led to high brightness beamlines at the NSLS.

Not only are excellent collimation and intensity essential for studying, at sufficient resolution, large cell dimensions like ribosomes, but it is also important to have these facilities available locally due to the short lifetime of some of the protein crystals.

Sam Krinsky (NSLS, BNL) presented an overview on some of the source development activities at the NSLS over the last few years, stressing that NSLS is a dynamic institution, with many significant improvements resulting in increased performance of the ring. For example, increased brightness by reducing emittance and increasing current from the original design, better beam stability by using a global feedback systems and, under development, a digital feedback system, and new devices using in-vacuum undulators and elliptically-polarized devices. Krinsky also elaborated on several proof-of-principle experiments at the Accelerator Test Facility (ATF), for example several FEL experiments including the VISA (Visible-to-Infrared Saturation Amplifier) experiment, and the development of photocathode RF guns.

Ilan Ben-Zvi (NSLS/ATF, BNL) gave an overview of an exciting new project being proposed by the NSLS - the photoinjected energy recovery LINAC (PERL). This proposed upgrade results from the union of two technologies: laser-photocathode RF guns (photoinjectors) and superconducting linear accelerators with beam energy recovery (Energy Recovering LINAC). The upgrade has the potential to bring the NSLS's users many new insertion device beam lines, brightness that is at the cutting edge of light-source performance and ultra-short pulse capabilities, much shorter than any extant synchrotron light source. An exciting prospect is that if it were possible to circulate the PERL beam through the existing NSLS x-ray ring, state-of-the-art brightness would be available to all beam lines, leveraging the investment already made in the existing facility.

Seth Darst (Rockefeller University) showed how synchrotron radiation-based crystallography is leading to new insights in structural biology with a talk on structural studies of the function and regulation of RNA polymerase in the transcription process. He commented that such insights would not have been possible without the advances in synchrotron radiation-based crystallography over the last few years.

Doug Hunter (Savannah River Technology Center) discussed the development and integration of synchrotron radiation x-ray techniques into an environmental research program. The talk focused on the interplay of the many x-ray techniques to provide insight to the understanding of the location and speciation of elements in a wide variety of environmental samples with a focus on their impact towards a fundamental understanding of the remediation of high-level radioactive waste, and in the pulp & paper manufacturing industry.

Jingguang Chen (U. Delaware) demonstrated the power of soft x-ray absorption spectroscopy in elucidating surface reaction mechanisms in catalysis. He showed data probing novel hydrogenation chemistry on nickel oxide monolayer films and, using data from early transition metal carbides, highlighted the power of NEXAFS to correlate data from model surfaces with that from realistic catalytic materials. He concluded by briefly discussing the in situ capabilities of NEXAFS using fluorescence yield with the example of lithium nickel oxides in methane oxidation.

The session closed with a talk by Jim Penner-Hahn (U. Michigan). He presented recent results on the local structure around the active zinc site in enzymes – the talk highlighted how new biochemistry can be learned using traditional x-ray spectroscopy.

In other business of the NSLS Users' Meeting, elections for the Users' Executive Committee members took place. Elected were Steve Almo (Albert Einstein College of Medicine), Dan Fischer (NIST), and Tony Lanzirotti (U. Chicago). Also announced were the results from the elections for the Special Interest Group (SPIG) representatives, the winners being Paul Stevens

(Exxon-Mobil Research & Engineering) for Industrial Users; Vince Harris (NRL) for EXAFS; Mike Dudley (SUNY Stony Brook) for Topography; Dave Mullins (ORNL) for UV/Photoemission; Mike Becker (Biology, BNL) for Biological Scattering & Diffraction; Mark Furhmann (Env. Sci., BNL) for Imaging; Lisa Miller (NSLS, BNL) for Infrared; Mahbub Khandaker (Jefferson Lab) for Nuclear Physics; Cecilia Sanchez-Hanker (NSLS, BNL) for Students/Postdocs; John Sutherland (Biology, BNL) for Time Resolved Spectroscopy; and Peter Stephens (SUNY Stony Brook) for X-ray Scattering & Crystallography.

The day ended with the conference banquet, which was held on-site with the theme of a Hawaiian luau. The cafeteria at Berkner Hall was transformed into an island paradise with tropical decorations and music. Attendees truly got into the theme: colorful Hawaiian shirts were worn by many, and leis were presented as one entered “the island.” There was entertainment in the form of Hawaiian music, dancers, and a fire dancer – along with some entertaining dancing by some of the attendees!